Attachment 3

CHLE-007: Debris Bed Requirements and Preparation Procedures

PROJECT DOCUMENTATION COVER PAGE

Document No: CHLE-007	Revision: 3	Page 1 of 9
Title: Debris Bed Requirements and Preparation Procedures		
Project: Corrosion/Head Loss Experiment (CHLE) Program		Date: 11 August 2012
Client: South Texas Project Nuclear Operating Company		

Summary/Purpose of Analysis or Calculation:

Corrosion/Head Loss Experiment (CHLE) tests are being performed to support the risk-informed resolution of GSI-191 at the South Texas Project Nuclear Operating Company (STP). Fiberglass debris will be added to the head loss modules in the CHLE tests to form a debris bed to investigate the interaction between the fiber and any corrosion products that may form. Capture of corrosion products may be manifested as an increase of head loss through the debris bed. This document describes the source, preparation, quantity, and procedures for addition of fiberglass and particulate matter to the head loss modules to form the debris beds.

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Revision	Date	Description
0	5/1/2012	Draft document for internal review
1	7/6/2012	Includes updates for blended fiber preparation method
2	8/8/2012	Includes edits from internal review
3	8/11/2012	Includes edits from oversight review

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Definitions and Acronyms

CHLE	Corrosion Head Loss Experiments
ECCS	Emergency Core Cooling System
NEI	Nuclear Energy Institute
NRC	Nuclear Regulatory Commission
PCI	Performance Contracting, Inc.
STP	South Texas Project Nuclear Operating Company

1 Purpose

A reproducible debris bed is an essential prerequisite to the Corrosion/Head Loss Experiments. Without a reproducible debris bed, it will be difficult to assess whether corrosion products cause an increase in head loss through the Emergency Core Cooling System (ECCS) strainers. This document describes the source of the materials that will be used to make the debris beds representative of STP conditions for the head loss experiments, the methods for preparing the materials and introducing them into the head loss modules, and experiments to determine the quantity of debris needed to make a suitable debris bed.

2 Methodology

The selection of debris and development of procedures is based partially on previous industry experience with head loss testing, as relayed to the project team by Alion Science and Technology. The debris preparation procedures are based on a guidance document developed by the Nuclear Energy Institute (NEI, 2012). The Nuclear Regulatory Commission (NRC) reviewed the NEI plan but declined to officially endorse it as the only way to produce acceptable debris because of the dependence on human actions (Ruland, 2012). The NEI document is included in Appendix A. The guidance from these sources forms the basis for the preliminary plan. The actual quantity of debris and procedures for forming the beds will be developed through experimental testing and validation as described in this document.

3 Design Input and Analyses

A schematic of the head loss modules is shown in Figure 1 and a photograph is shown in Figure 2. The modules have an inside diameter of 6.0 inches and cross-sectional area of 0.196 ft^2. With an approach velocity of 0.010 ft/s, the required flow rate is 0.88 gpm. The debris bed requirements, material sources, preparation, quantity, addition procedures, and acceptance criteria are described in the following sections.

3.1 Debris Bed Requirements

The debris beds are formed with only NUKON™ fiberglass insulation or a combination of NUKON™ and silicon carbide particles. Once the appropriate debris quantities have been established, all beds should be prepared with the same quantity of debris. A properly formed bed will be reproducible with head loss varying by no more than ± 25 percent from one bed to the next and be visually uniform with a top surface that appears horizontal with vertical variation of no more than 0.5 inches (1.27 cm) as relayed to the project team by Alion Science and Technology.

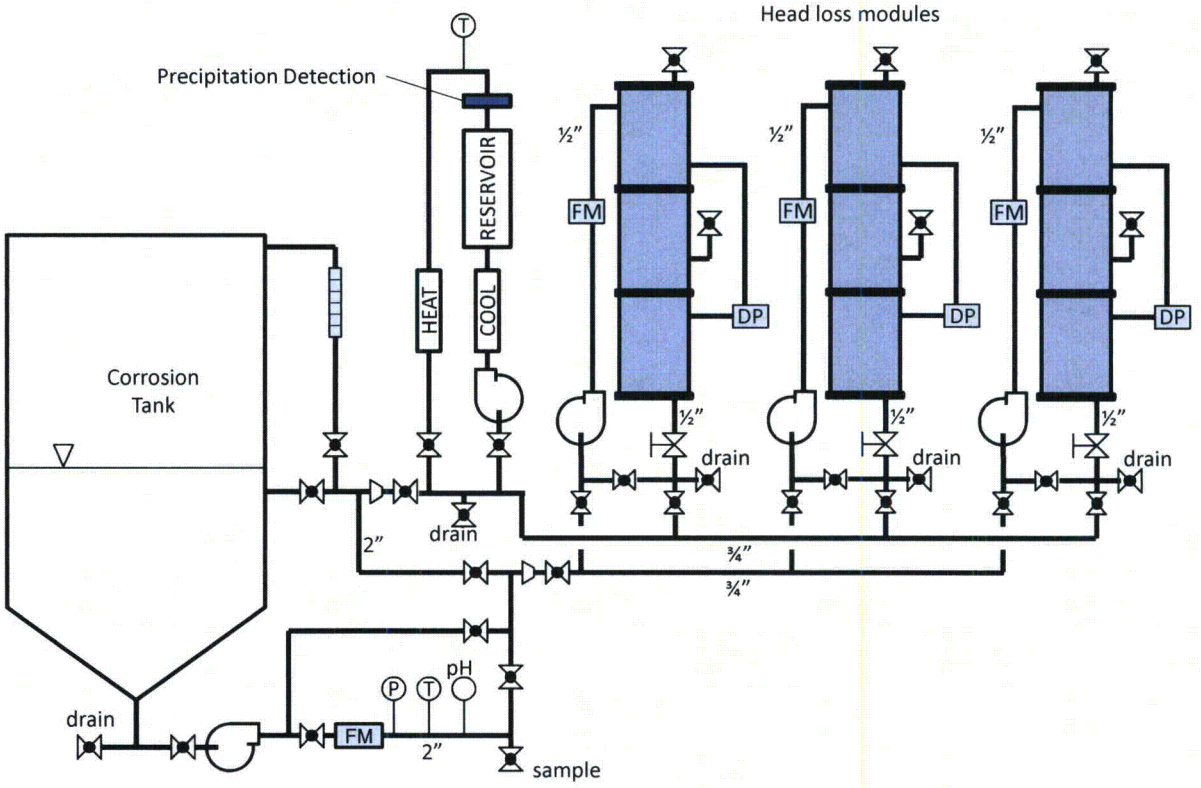

Figure 1 – Schematic of Head Loss Modules.

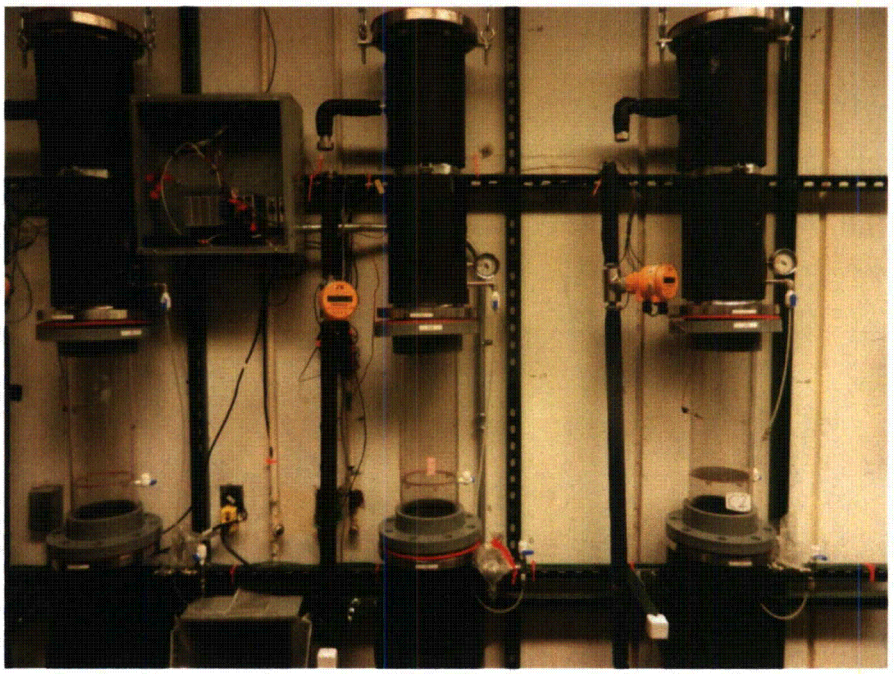

Figure 2 – Photograph of Head Loss Modules.

3.2 Material Source and Specifications

NUKON™ fiberglass insulation was purchased from Performance Contracting Inc., 16047 West 110th Street, Lenexa, KS 66219 (PCI). The blankets used are 2 feet x 4 feet x 2.5 inches thick and have a bulk specific weight of 2.4 lb/ft^3. The blankets are heat-treated on one side according to the procedure in NEI (2012) by PCI prior to being shipped to UNM.

The silicon carbide is Green Silicon Carbide, size F600, manufactured by Electro Abrasives, LLC., 701 Willet Road, Buffalo, NY 14218. Green Silicon Carbide is an extremely hard (Moh 9.4) manmade mineral. The F600 grit has a size distribution between about 5 and 30 µm. The nominal size distribution as reported on the Electro Abrasives website is shown in Figure 3. The size distribution was not independently validated for this project because the only purpose of the particles is to produce a reproducible debris bed. Typical composition, as reported on the Electro Abrasives website is shown in Table 1. The MSDS sheet is included in Appendix B.

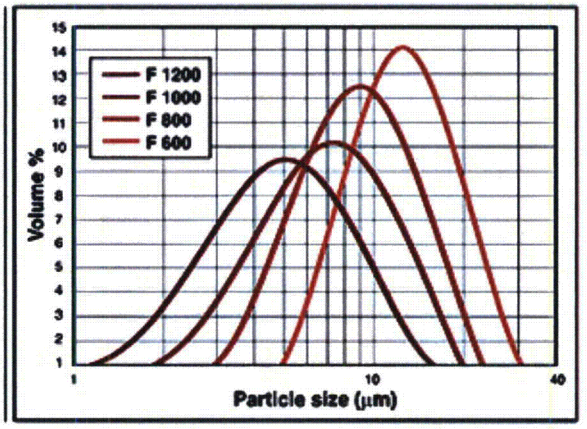

Figure 3 – Size Distribution for Green Silicon Carbide as reported by Electro Abrasives, LLC.

Table 1 – Typical Composition of Green Silicon Carbide as reported by Electro Abrasives, LLC.

Species	Composition (percent)
SiC	99.5
SiO_2	0.2
Si	0.03
Fe	0.04
C	0.1

3.3 Debris Bed Quantity

The thickness of debris bed required to achieve the desired head loss has not been identified in previous testing and is unknown. Testing that examined a range of conditions is summarized in Section 4 below. Nominally, the tested beds focused on 1-inch thick increments based on nominal bed density, which requires 0.016 ft^3 or 0.039 lb (17.8 g) of fiberglass. Debris quantities up to 140 g were tested.

3.4 Debris Preparation

Methods for aging fibrous debris preparation were developed in earlier experimental programs and are described in Section 6.3 of NEI (2012). Aging of the NUKON™ insulation for UNM CHLE test was performed by PCI (baked on one side). No further preparations of the raw materials (NUKON™ or the green silicon carbide) were performed at UNM.

Two fiber bed preparation methods were used in the UNM CHLE tests, described as the NEI fiber preparation method (Section 3.4.1) and the blended method (Section 3.4.2). Instruction for preparation of silicon carbide or how to make debris beds with this material was not found in the NEI or other debris preparation/ bed formation documents. The silicon carbide is weighed on a top-loading balance to a resolution of 0.01 g and added to the NUKON™ mixture as relayed to the project team by Alion Science and Technology.

3.4.1 NEI Fiber Preparation Method

Fine debris is generated with a pressure washer using the procedure described in Section 6.6 of NEI (2012). The procedure for creating various classes of debris from NUKON™ fiberglass is described in the NEI document. For the CHLE head loss tests, all fiberglass debris is categorized as fines according to the size classification scheme in Table 3-2 in NUREG/CR-6808 (2003). Table 3-2 is included in Appendix C. Water for the preparation of fiber was deionized water by reverse osmosis treatment to achieve a conductivity ≤ 50 µS/cm.

A section with equal portions of baked and unbaked NUKON™ fiber is taken from the fiber blanket shipped from PCI. The fiber weight is determined using a top-loading balance with a resolution of 0.01 g and recorded prior to the fiber being separated. Detailed step-wise direction of this preparation is included in Appendix D. Initial batches of NUKON™ fiberglass is separated by first splitting the fiber into four equal sheets, two unbaked sections and two baked sections. The four sections of the NUKON™ blanket are then cut with shears into approximately 1" X 1" sections followed by hand tearing the unbaked portions to produce approximately 0.5" X 0.5 " sections. The prepared fiber is placed in a clean 5-gal pail with approximately 1 inch of RO water in the bottom of the pail. Fibers are separated using RO water run through a Cleanforce 1800-psi 1.5 gpm Axial Cam Heavy-Duty Electric pressure washer (Model # CF1800HD)with a 40 degree small diameter fan type tip, with the nozzle maintained slightly below the water surface. The fiber is subjected to the process until it passes a visual inspection. The degree of fiber separation is confirmed by visual inspection, by pouring the mixture into a glass dish, placing the

dish on a light table, and swirling the solution gently. The resulting fiber clumps are then compared to the pictures in Appendix C.

The required fiber-mass-to-water-volume ratio is less than or equal to 0.21 lb/gal (25 g/L). A batch with 18 g of fiber requires a minimum of 0.72 L which is less water than results due to the separation process. Therefore, the processed, separated fibers are collected in a stainless steel fine mesh kitchen colander. Buffered, borated solution is then added to the strained fiber prior to loop addition.

3.4.2 Blended Fiber Preparation Method

Blended debris is generated using a Black and Decker model number BS2100S. The fiber is weighed, separated, and cut in the same way as described above, see Appendix D for detailed information. To separate the fiber into fines, this method uses the blender instead of the pressure washer. The pieces of fiber are place in the blender and mixed with 0.8 L of buffered, borated solution. The blender is then switched to the chop setting and allowed to blend for 25 seconds. The mixture is poured into a beaker and the blender swished once to remove fiber that clung to the sides and blades. The fiber does not require any straining or addition of water.

3.5 Debris Addition Procedures

Experience with various methods of debris introduction in previous testing demonstrated that maintaining a low approach velocity and adding the debris mixture slowly produces the most uniform bed. The method used for adding NUKON™ to the test system will be as follows. The test section will be filled with DI water at room temperature to one inch above the level of the inlet pipe. The inlet pipe is 6 inches below the top of the head loss modules. The distance between the top opening of the head loss modules and the debris support screen is about 50 inches. The recirculation pump will be turned on and the flow control valve set to the flow rate that corresponds to an approach velocity of 0.1 ft/s in the test section. Trisodium phosphate dodecahydrate and boric acid in quantities reflective of STP chemistry is then added to the loop and allowed to dissolve.

The debris mixture will be agitated thoroughly using a glass stir rod prior to addition to the test loop. The debris will then be added slowly over the course of two minutes while constantly being stirred to keep the fibers agitated. After the debris mixture has settled against the screen, the pump will be allowed to circulate until the head loss reaches an approximate zero slope on the graph of differential pressure versus time. Once this conditions has been met, the head loss is considered to be stabilized. Once the head loss is stabilized, the loop velocity is reduced to the test velocity of 0.01 ft/s. The head loss will be recorded over the circulation time.

3.6 Debris Bed Validation and Acceptance

The condition of the fiber fines will be validated by visual comparison to the table in Appendix C while the fiber solution is swirled gently in a glass dish placed on a light table.

The fiber bed will be acceptable when it meets the criteria described in Section 3.1.

4 Results

Detailed results of the experiments to develop reproducible debris beds are presented elsewhere (UNM, 2012). This section is intended to briefly summarize key results associated with bed characteristics as a result of different preparation approaches. The beds tested were not successful in retaining silicon carbide particles; therefore this material was not used in further testing. The original target for head loss for the debris beds was 0.50 ± 0.20 feet (0.22 ± 0.087 psi) of head loss when the approach velocity of water through the bed is 0.0090 ft/s and the temperature is 185 °F, after the head loss through the beds has been allowed to stabilize for 1 hour. Based on a linear ratio to water viscosity, the target head loss at room temperature (68 °F) is 1.50 ± 0.60 feet (0.65 ± 0.26 psi). Initial testing revealed that it was not possible to achieve this head loss with quantities of NUKON debris that are representative of realistic debris beds in the STP containment because of the low approach velocity and lack of particles in the debris beds.

With the blended bed methodology, a 20 gram mass of fiber resulted in a very uniform 0.5 to 0.625 inch (1.34-1.6 cm) bed with 6.22 to 6.37 inches of head loss at 0.1 ft/s and 0.55 to 0.68 inches of head loss at 0.01 ft/s with water at room temperature. With the NEI bed methodology, a 20 gram mass of NEI processed fiber produced beds with approximately 2 inch (5 cm) of height with a head loss of approximately 2.75 inches of water at 0.1 ft/s and 0.5 inches at 0.01 ft/s with water at room temperature. The initial head loss was lower than originally intended but the reproducibility was acceptable. Because the test apparatus instrumentation can detect small changes in head loss (0.1 inches of water), the lower than expect initial head loss was deemed acceptable. In later multi-day testing, the blender processed fiber beds increased in head loss without particulate in solution as time progressed whereas the NEI processed fiber beds maintained its initial head loss throughout the duration of testing. In both tests, the bed thickness did not change significantly during the tests. Upon draining the column and removal of beds, the blender process beds lost 33 percent of their initial height, while the NEI process beds lost 40 percent of their initial height.

5 References

Nuclear Energy Institute (NEI). "ZOI Fibrous Debris Preparation: Processing, Storage, and Handling, Revision 1", January 2012.

NUREG/CR-6808. "Knowledge Base for the Effect of Debris on Pressurized Water Reactor Core Cooling Sump Performance," February, 2003.

Ruland, W.H. Letter to John Butler of the Nuclear Energy Institute with the subject line "Fibrous Debris Preparation procedure for Emerengy Core Cooling System Recirculation Sump Strainer Testing, Revision 1" dated April 26, 2012.

University of New Mexico (UNM). "CHLE-008 Debris Bed Formation Results, Rev 2", June 2012

APPENDIX A

ZOI FIBROUS DEBRIS PREPARATION: PROCESSING, STORAGE, AND HANDLING

REVISION 1, JANUARY 2012

NUCLEAR ENERGY INSTITUTE

ZOI Fibrous Debris Preparation: Processing, Storage and Handling

Revision 1
January 2012

Nuclear Energy Institute

Generic Procedure

ZOI Fibrous Debris Preparation: Processing, Storage and Handling

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ZOI Fibrous Debris Preparation: Processing, Storage and Handling

1. SCOPE

This document covers the procedures for processing, storage and handling of the fiber that will be used in sump strainer testing. The resulting fibrous debris from this procedure is intended to represent fibrous material generated as a result of jet impingement within the appropriate zone of influence (ZOI). The overall test program is described in a test plan. This document is intended to outline the procedures to be used by the technical support team to process, store and handle fibrous debris that will be used as part of the test program. The material will be procured externally and processed to meet the requirements before it is used.

2. PURPOSE

The purpose of this document is to ensure that the requirements for processing, storage and handling of the fibrous debris that will be used for the XYZ Sump Strainer Test Program will be met, and that any additional requirements relating to processing, storage and handling are also identified.

3. DEFINITIONS

- Fines – readily suspendable in water (Classes 1 through 3 of Table 3-2 of NUREG/CR-6808)
- Small pieces – clumps of fibers ≤ 4 inches on a side (Classes 4 through 6 of Table 3-2 of NUREG/CR-6808)
- Large pieces – clumps of fibers > 4 inches on a side (Class 7 of Table 3-2 of NUREG/CR-6808)

4. GENERAL REQUIREMENTS

- The fiber required for the testing is specified in the test plan as to the type of material to be used for preparation per this document, e.g., Nukon, Mineral Wool, Temp-Mat, etc. The fibers will be processed as fines, small pieces, and large pieces, as dictated by the test plan.

- All weight measurements shall be performed using calibrated scales.
- The weighed debris must be stored and clearly labelled with weight, type, and date. This is done to prevent the possibility of incorrectly identifying the material at the time of its use. Documentation of the weighed debris shall be per the requirements of the test plan.
- The debris must be handled in a safe manner to ensure minimal hazard to personnel. Each relevant material safety data sheet (MSDS) must be read before handling debris and each worker must wear appropriate personal protective equipment (PPE).
- A data sheet, in a form similar to Attachment B, shall be used to document the completion of the applicable steps of this procedure.

5. RESPONSIBILITIES

The Scope of Work will be performed in accordance with this document and the test plan developed for the specific client.

6. PROCESS

This section identifies the procedures to be used to procure, store, process and handle fibrous debris. Fibrous debris will be heated on a hot plate to simulate the aged insulation in the plant before a loss of coolant accident (LOCA), and processed to achieve the required fiber size distribution.

6.1 Safety

Due to its potential negative effect on health and status as an irritant, the fiber material requires appropriate safety precautions when handling. These procedures are outlined in Appendix A. Due care must be used to ensure operator safety.

6.2 Initial Procurement and Storage

Fiber materials will be procured from specified manufacturers. The procured materials will be stored in a sheltered location prior to further processing. The fiber will normally be received as rolls or bundles.

6.3 Aging of Fiber

> **NOTE**
> Fiber material that had previously been heat treated, but may not have had full documentation as provided in the following steps may still be used for final debris size preparation provided a visual inspection of the acceptability of the heat treatment (as described below) is performed and documented within the test plan.

- The fiber shall be aged by heating one side of the insulation on a hot plate at 300°C, ± 38°C for 6 to 8 hours. (Previous testing has shown this temperature and time to be adequate to appropriately age the material.)

  The specific aging procedure is as follows:

  - A batch (sheet) of fiber is placed on the hot plate.
  - A method is provided to periodically monitor plate temperature.
  - The hot plate is energized with the time of starting recorded.
  - When plate temperature reaches the required temperature, the time is recorded (start of 6 to 8 hour heating).
  - After time at temperature, the hot plate is deenergized. This time is recorded.
  - When safe to do so, the insulation material is removed from the hot plate and allowed to cool to near ambient conditions.
  - The insulation is then inspected to ensure the heat treatment was effective. Inspection criteria for acceptance is a gradient of color in the fiberglass from the hot face to approximately half way through the thickness of the insulation sheet commensurate with the temperature gradient through the insulation sheet. (Reference 7.b)
  - The aged fiber is then weighed and placed into labelled bags that identifies the type of fiber, how processed, and the weight.

6.4 Storage of Fiber

The aged insulation is stored in a sheltered location approved by the testing engineer. Each bag is labelled to identify how the debris was processed, the type of debris, the batch number and the lot number, if available.

> **NOTE**
> Prior to performance of Step 6.5, if used, the mass of material specified by the test plan shall be obtained as specified in the first two bullets of Step 6.6. Post-soaking weights do not need to be obtained.

6.5 Soaking of Aged Debris (Optional)

As specified by the test plan, the aged debris may be soaked to remove the aging produced particulate matter such as unattached binders and combustion products. This is done by soaking the fibrous debris in a container of water for no less than two minutes and then draining the contents through a Tyler 65 mesh screen (or functional equivalent) to remove small particles and excess water. If used, this step should be accomplished just prior to subsequent steps to prepare the fibers for testing. Long term storage of wetted materials in closed containers should be avoided.

6.6 Preparation of Aged Debris Fines

> NOTE
> Wetted materials should not be stored for longer than approximately 24 hours prior to use due to the potential for changes to the properties of the material.

- The mass of fiber required by the test plan is identified and this quantity is removed from the bulk aged material through either mechanical means (shears, knife, or equivalent) or by hand separation.
- The removed aged fiber is then weighed and recorded.
- Smaller batches of fiber are then separated from the quantity separated from the bulk quantity by pulling material such that the final volume will result in a fiber to water ratio of ≤ 0.72 lbs/gal (86 gm/l) of water.
- The smaller batches of fiber are then placed in the bottom of a suitable container (typically a cut off section of a plastic barrel) that has been rinsed clean of other materials and contains the required amount of water necessary to maintain the specified fiber volume to water ratio.

> **NOTE**
> - Precautions should be taken during the following step to minimize direct impingement of the water jet on the fibers.
> - The quantity of water required for the following step is not as important as the ability to verify that the fibers are separated and readily suspendable in the resulting solution.

- Fiber separation is then accomplished by using a high pressure water jet from a commercially available 1500 psi pressure washer with a small diameter fan type tip (recommended), with the nozzle maintained at slightly above or slightly below the water surface. The time necessary to separate the clumps into individual fibers varies, but is generally accomplished within about 2 to 4 minutes.
- The degree of fiber separation is confirmed, by visual inspection, to meet expectations and consistency with previous batches, including meeting the definition of fines provided previously.
- Several batches, prepared as described above for subsequent introduction and use in testing, are then mixed together to create the quantity needed for testing. The batches that are mixed should be combined such that the combined mixture results in a fiber mass to volume of water ratio less than or equal to approximately 0.21 lbs/gal (25 gm/l). The combined materials are then agitated through use of the pressure washer previously described or with other mechanical agitation (paddle or paint stirrer) prior to addition to the test loop. The test plan shall contain the necessary step to verify that minimal agglomeration of the fibers has occurred at the time of addition to the test loop.

6.7 Preparation of Aged Debris Small and Large Pieces

> NOTE
> Wetted materials should not be stored for longer than approximately 24 hours prior to use due to the potential for changes to the properties of the material.

- The mass of fiber (small or large pieces) for each specific addition is measured and soaked in a sufficient quantity of water in a suitable container, or as specified by the test plan.
- The mixture is then stirred with a hand paddle until the pieces are fully saturated and separated from one another (usually 30 seconds to one minute).
- The degree of fiber clumps separation is confirmed to meet expectations and consistency with previous batches, including meeting the definition of small or large pieces previously provided.

6.8 Photographs of Fibrous Debris

Prior to the fiber addition, photographs of prepared fiber may be taken to confirm that the desired size distribution is acceptable.

6.9 Records

The test plan shall specify the methods to be used for documenting the debris preparation information generated as a result of this document. For fibrous debris preparation, the Datasheet shown in Appendix B is an example of the type of documentation that can be used. The Datasheet records key information such as material processing date(s), reference purchase order number, mass, instruments used, etc.

7. REFERENCES

a. Revised Guidance for Review of Final Licensee Responses to Generic Letter 2004-02, "Potential Impact of Debris Blockage On Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors", March 28, 2008 (ML080230234)
b. NUREG/CR-6808, "Knowledge Base for the Effect of Debris on Pressurized Water Reactor Core Cooling Sump Performance," February 2003

Appendix A

Safe Handling of Fibrous Materials

Fibrous materials can cause irritation due to contact (see MSDS before handling). In addition, some of the fibers or fiber products produced can be inhaled or ingested which represents a personnel risk unless necessary precautions are taken. Personnel handling this material should wear appropriate PPE, including an appropriate air filtration mask, safety glasses, gloves and long-sleeved clothing to prevent skin irritation. If necessary, a shower should be taken after handling to remove fibers. Care should be taken during processing and handling to minimize airborne fibers.

Appendix B

Example Datasheet for Fibrous Material Preparation

Test Number	Test Date	Mass of Nukon Required (g or lbs)	Mass of Mineral Wool Required (g or lbs)	Mass of Temp-Mat Required (g or lbs)	Mass of XXX Fiber Required (g or lbs)	Weigh Scale Instrument Number	Aged Fiber Batch #	Separation Method	Operator

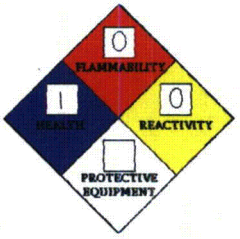
APPENDIX B

MATERIAL SAFETY DATA SHEET (MSDS)

FOR GREEN SILICON CARBIDE

ELECTRO ABRASIVES

ELECTRO ABRASIVES CORPORATION
701 Willet Road
Buffalo, NY 14218
Telephone: 716-822-2500
Fax: 716-822-2858
e-mail: info@electroabrasives.com
web-site: www.electroabrasives.com



NFPA

HMIS

MATERIAL SAFETY DATA SHEET

Rev 5/12/08

To the purchaser: This MSDS contains important environmental safety and health information for your employees who will be using this product. Please be sure this information is given to them. If you resell this product, a copy of the MSDS should be given to the buyer.

MANUFACTURERS NAME: **Electro Abrasives Corp** PHONE NO: **716-822-2500**
ADDRESS: **701 Willet Road Buffalo New York 14218**

SECTION I

TRADE NAME: **Electrocarb** DOT CLASS ID NUMBER: **N/A**
CHEMICAL & COMMON NAME(S): **Green Silicon Carbide Grain**
FORMULA: **SiC**

SECTION II

OSHA POTENTIAL HAZARDOUS INGREDIENTS % EXPOSURE LIMITS

COMPONENT	CAS #	(optional)	ACGIH-TLV	OSHA PEL	OTHER
SiC	**409-21-2**		**99+**	**10mg/m3**	**15mg/m3 Total Dust**

SECTION III. PHYSICAL DATA

BOILING POINT (deg F)	**N/A**	SPECIFIC GRAVITY (H2O = 1)	**3.2**
VAPOR PRESSURE (mm Hg)	**N/A**	ACIDITY (ph)	**6-7**
VAPOR DENSITY (AIR = 1)	**N/A**	EVAPORATION RATE (BUTL ACETATE = 1	**N/A**
SOLUBILITY IN WATER	**(Negligible)**	MELTING POINT	**SUBLIMES AT 4700 deg F**

VOLATILES BY VOLUME **N/A**

APPEARANCE & ODOR **Shiny, green, granular-odorless material**

SECTION IV. FIRE & EXPLOSION HAZARD DATA

FLASH POINT **N/A** FLAMMABLE LIMITS : LEL: **N/A**

DEL: **N/A**

EXTINGUISHING MEDIA: **Not flammable**

SPECIAL FIRE FIGHTING PROCEDURES: **None required**

UNUSUAL FIRE & EXPLOSION HAZARDS: (See Reactivity Section for other physical hazards) **None**

SECTION V. REACTIVITY DATA

STABILITY:	**STABLE**
CONDITIONS TO AVOID:	**NONE**
INCOMPATIBILITY (Materials to Avoid):	**NONE**
HAZARDOUS DECOMPOSITION PRODUCTS:	**NONE**
HAZARDOUS POLYMERSATION:	**WILL NOT OCCUR**

SECTION VI. HEALTH HAZARD DATA

PRIMARY ROUTES OF ENTRY: **NASAL**

LISTED AS CARCINOGEN: **NO**

SYMTOMS AND EFFECTS OF OVEREXPOSURE:

Lung irritation may be evidenced by shortness of breath. Prolonged exposure may lead to pulmonary problems. Avoid dust from Sic 240 mesh & finer.

EMERGENCY AND FIRST AID PROCEDURES:

Remove from dusty area.

SECTION VII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:

Uncontaminated material may be scooped up for use.
If Contaminated scoop or vacuum into a receptacle for disposal.

WASTE DISPOSAL METHOD:

Use a sanitary landfill in accordance with local, State, and Federal regulations.

SECTION VIII. RECOMMENDED CONTROL MEASURES

RESPIRATORY PROTECTION: **U.S. Bureau of Mines approved for dusts and pneumoconiosis**.
VENTILATION: LOCAL EXHUAST: **Normal dust collector**.
MECHANICAL (General) : **N/A**
SPECIAL: **N/A**
PROTECTIVE GLOVES: **N/A**. EYE PROTECTION: **Goggles**
OTHER PROTECTIVE EQUIPMENT: **N/A**
SPECIAL PROTECTIVE MEASURES FOR REPAIR AND MAINTENANCE OF CONTAMINATED EQUIPMENT: **N/A**

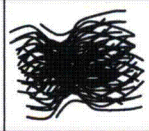
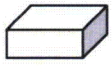
SECTION IX. SPECIAL PRECAUTIONS

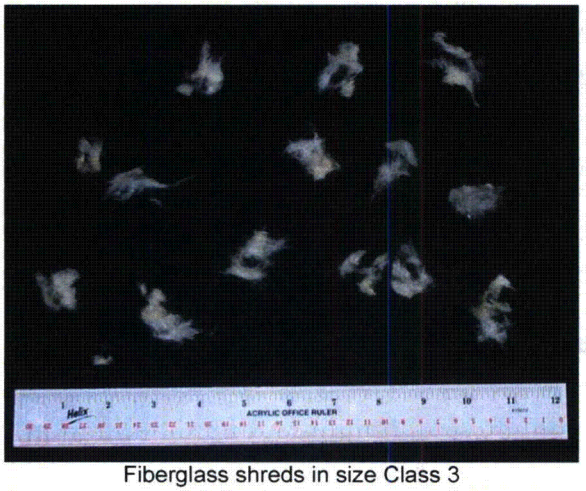
PRECAUTIONS TO BE TAKEN IN HANDLING & STORING (Including appropriate hygienic practices)
Use with commonly accepted industrial safety procedures. Avoid ingestion, inhalation of dust, exposure to eyes or prolonged contact with skin.

APPENDIX C

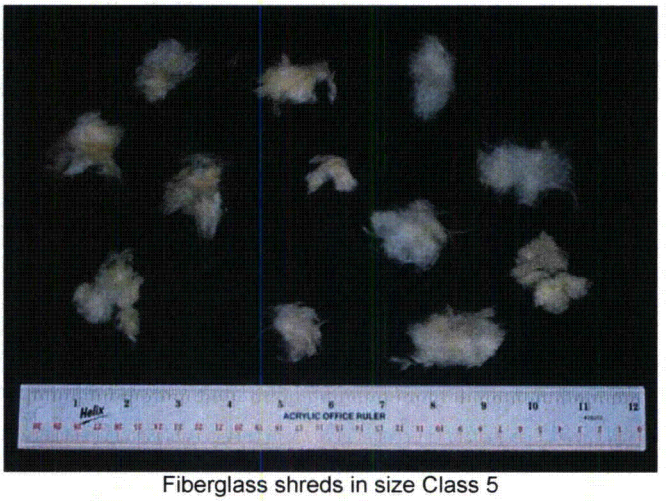
NUREG/CR-6808, TABLE 3-2

SIZE CLASSIFICATION SCHEME FOR FIBROUS DEBRIS

Table 3-2 Size Classification Scheme for Fibrous Debris[3-2]		
No.	Description	
1		Very small pieces of fiberglass material; "microscopic" fines that appear to be cylinders of varying L/D.
2		Single, flexible strands of fiberglass; essentially acts as a suspending strand.
3		Multiple attached or interwoven strands that exhibit considerable flexibility and that, because of random orientations induced by turbulent drag, can exhibit low settling velocities.
4		Fiber clusters that have more rigidity than Class 3 debris and that react to drag forces as a semi-rigid body.
5		Clumps of fibrous debris that have been noted to sink when saturated with water. Generated by different methods by various researchers but easily created by manual shredding of fiber matting.
6		Larger clumps of fibers lying between Classes 5 and 7.
7		Fragments of fiber that retain some aspects of the original rectangular construction of the fiber matting. Typically precut pieces of a large blanket to simulate moderate-size segments of original blanket.



Fiberglass shreds in size Class 3



Fiberglass shreds in size Class 5

Figure 3-3. Fiberglass Insulation Debris of Two Example Size Classes

APPENDIX D

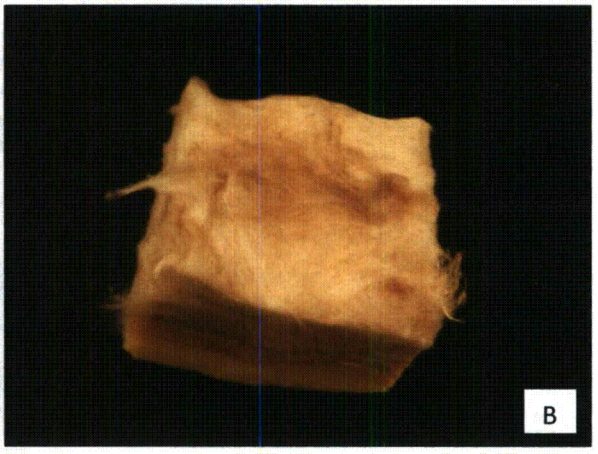
DETAILS AND PHOTOGRAPHS OF DEBRIS PREPARATION PROCEDURES

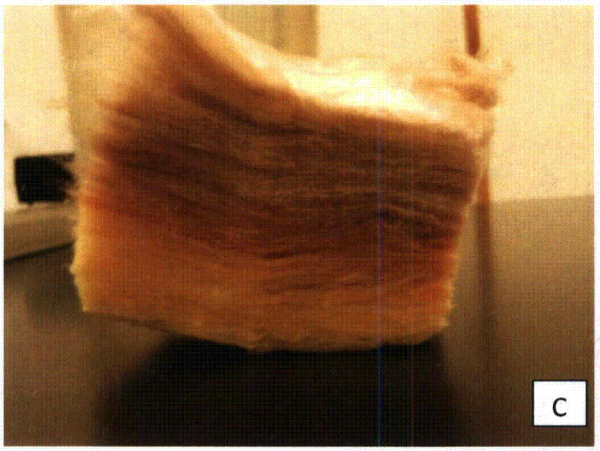
Appendix D

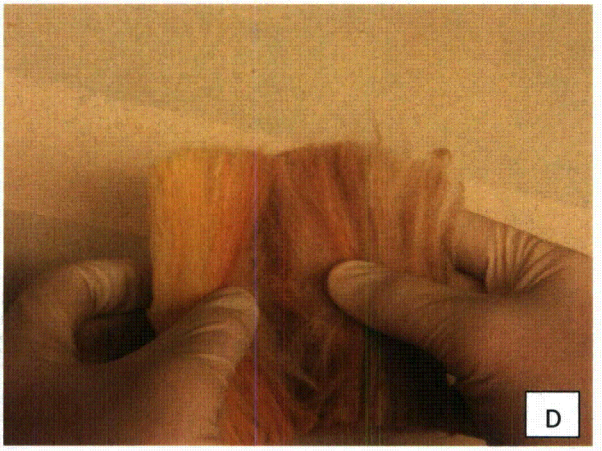
Images below are intenteded to provided clarification of the fiber debris preparation preparation.

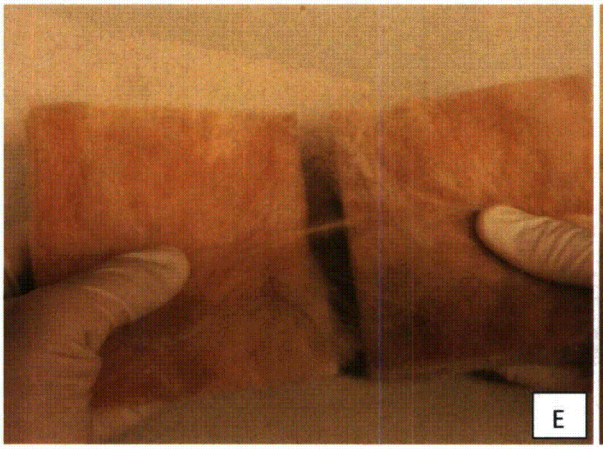
A. Don appropriate PPE which included laboratory jacket, glasses, gloves, and a dust mask.
B. Cut a section of the large fiber blanket provided by PCI, weigh it using scale with 0.01 gram accuracy, and record mass.
C. The section should contain equal portions of the baked (tan) and unbaked (yellow) sections of fiber.
D. The weighed section should be visually separated into baked and unbaked sections.
E. The baked section should be separated again.
F. The unbaked section should be separated again.
G. The separation should result into four equivalent sections of fiber (two baked and two unbaked sections).
H. The fiber section should be cut length wise.
I. The length wise section should be cut to result in approximately 1" X 1" section of fiber.
J. All four sections should be cut as explained by steps H and I.
K. The unbaked 1" X 1" sections should be torn in half by hand again to produce 0.5" X 0.5" sections because it is more difficult to separate the unbaked sections with the pressure washer.
L. The fiber is now ready to be processed either by the blender or pressure washer.
M. Fiber after NEI method.
N. Fiber after blender method.

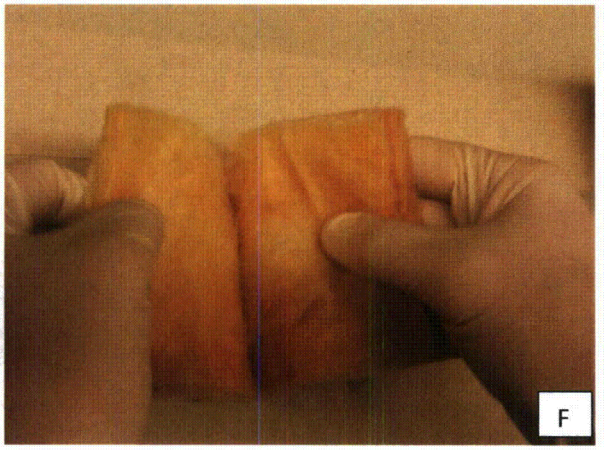

A


B

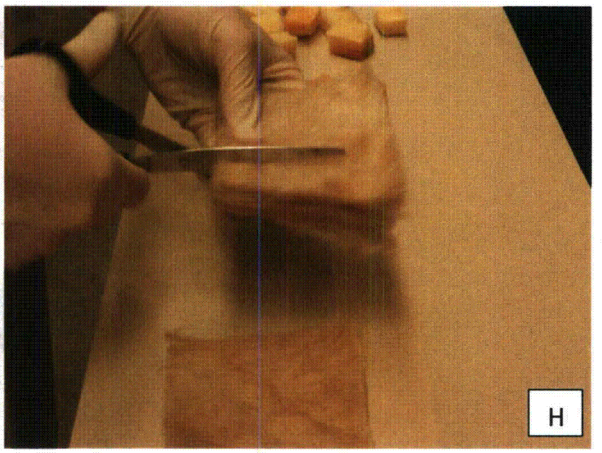

C


D


E

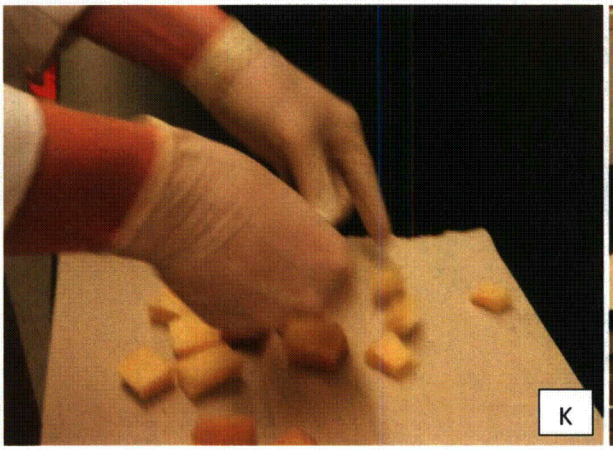

F


G

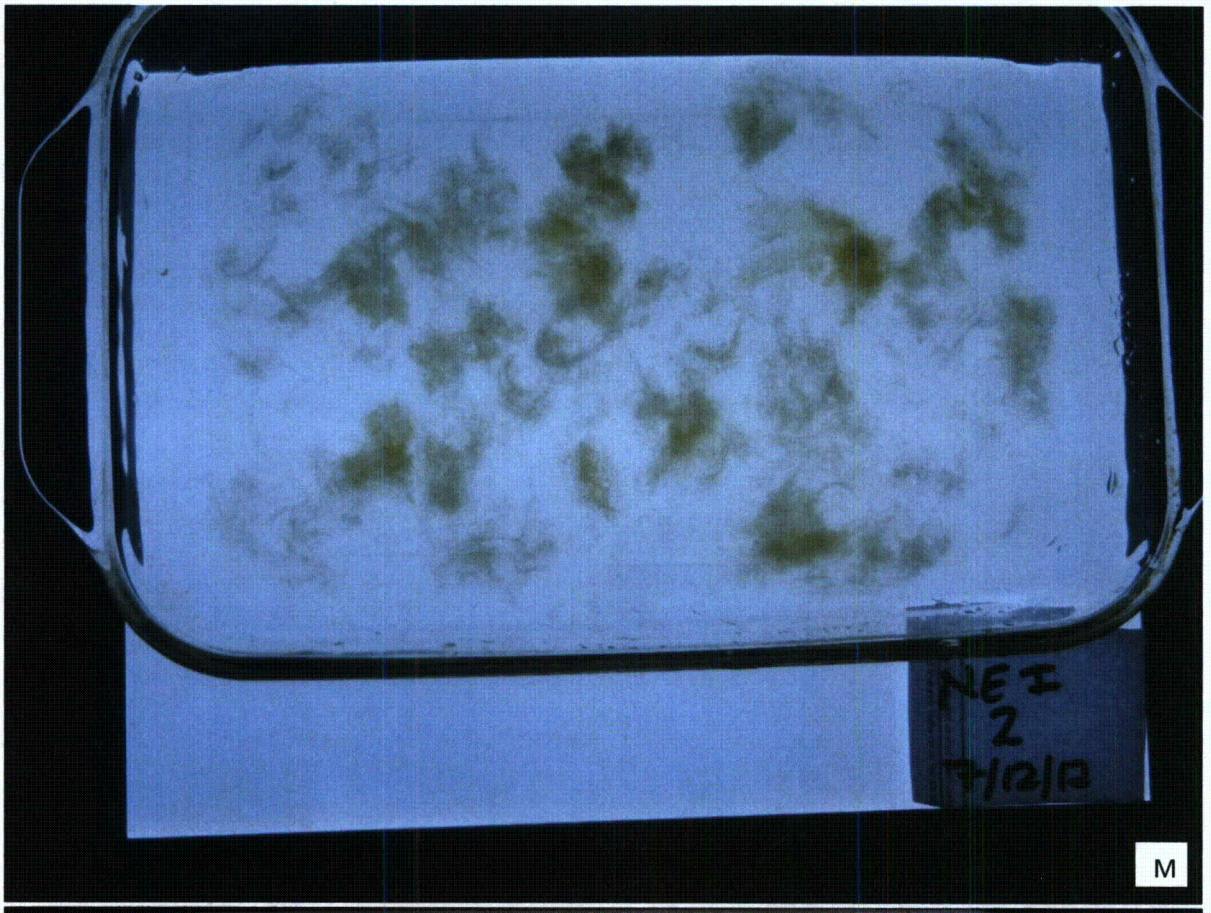

H

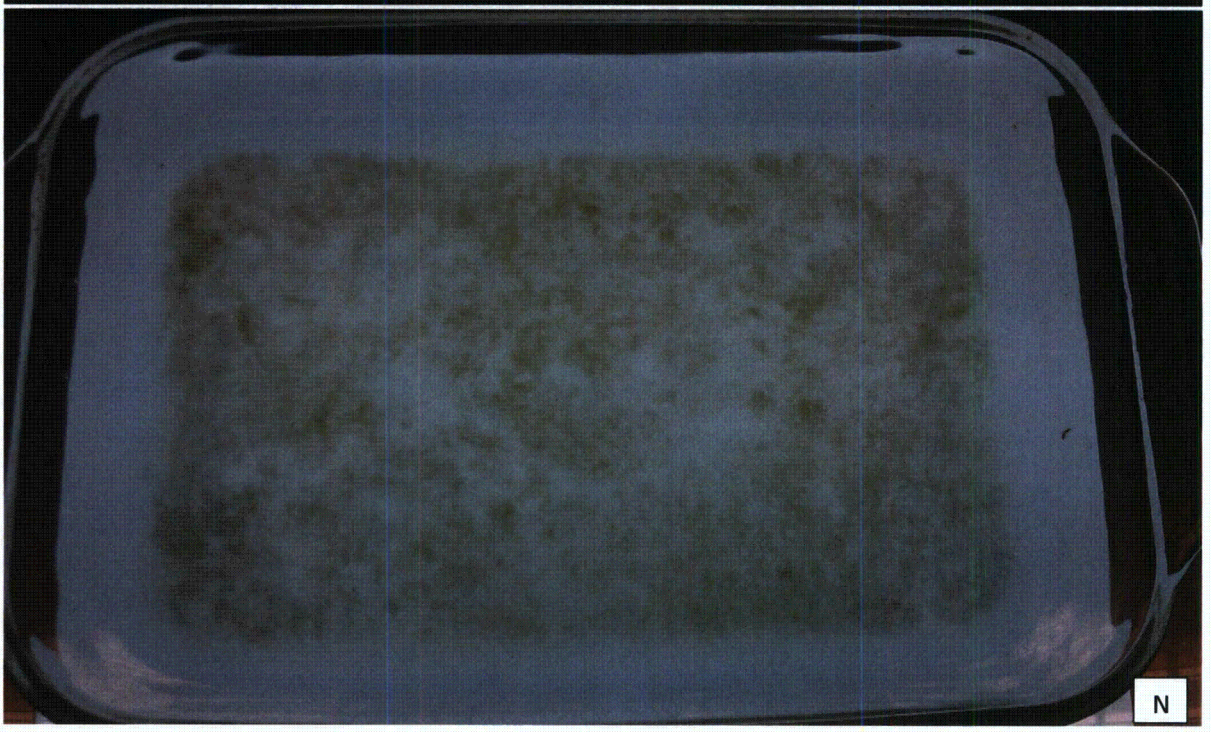

I


J


K


L


NEI
2
THIN
M


N